

We claim:

- 1 1. A method of operably interconnecting an electrooptic (EO) polymer
2 waveguide and a passive polymer waveguide, comprising:
3 providing a tapered electrooptic (EO) polymer waveguide interconnection
4 structure between an EO polymer waveguide and a passive polymer waveguide.
- 1 2. A method of fabricating a waveguide structure, comprising:
2 coating a passive polymer lower cladding over a substrate;
3 coating a passive core layer lower portion over the passive polymer lower
4 cladding;
5 curing the passive polymer lower cladding and the passive core layer lower
6 portion;
7 coating an electrooptic (EO) polymer layer over the passive core layer lower
8 portion;
9 etching the EO polymer layer to produce a tapered EO polymer layer with a
10 tapered region;
11 coating an passive core layer upper portion over the tapered EO polymer layer;
12 etching the tapered EO polymer layer to produce a rib waveguide structure;
13 and
14 coating a passive polymer upper cladding over the rib waveguide structure.
- 1 3. The method of fabricating a waveguide structure of claim 2, wherein
2 the passive polymer lower cladding and the passive core layer lower portion are cured
3 with ultraviolet (UV) light.
- 1 4. The method of fabricating a waveguide structure of claim 2, wherein
2 the passive polymer lower cladding and the passive core layer lower portion are cured
3 in a nitrogen environment.

1 5. The method of fabricating a waveguide structure of claim 2, wherein
2 the EO polymer layer is etched by oxygen plasma with a shadow mask to produce the
3 tapered region.

1 6. The method of fabricating a waveguide structure of claim 5, wherein a
2 fixed radio frequency (RF) power and gas pressure are employed for etching the EO
3 polymer layer.

1 7. The method of fabricating a waveguide structure of claim 5, wherein a
2 width of a gap between the EO polymer layer and the shadow mask is selected to
3 control a taper length of the tapered region.

1 8. The method of fabricating a waveguide structure of claim 2, wherein
2 the tapered EO polymer layer is etched by:
3 printing waveguide patterns over the tapered EO polymer layer; and
4 employing an oxygen reactive ion etching process to produce the rib
5 waveguide structure.

1 9. A waveguide structure, comprising:
2 an electrooptic (EO) polymer waveguide;
3 a passive polymer waveguide; and
4 a tapered EO polymer waveguide interconnection structure between the EO
5 polymer waveguide and the passive polymer waveguide.

1 10. The waveguide structure of claim 9, wherein the EO polymer
2 waveguide and the passive polymer waveguide provide single mode propagation, and
3 the interconnection structure provides a coupling between the two waveguides without
4 higher order mode coupling.

1 11. The waveguide structure of claim 9, wherein an interconnection loss
2 associated with the interconnection structure is less than 0.4 dB.

1 12. The waveguide structure of claim 9, wherein the interconnection
2 structure is vertically tapered.

1 13. The waveguide structure of claim 9, wherein a taper length of the
2 interconnection structure is 300 μm or more.

1 14. The waveguide structure of claim 9, wherein a taper angle of the
2 interconnection structure is no greater than 0.4 degrees.

1 15. The waveguide structure of claim 9, wherein the EO polymer
2 waveguide and the passive polymer waveguide are formed as rib structures.

1 16. The waveguide structure of claim 9, wherein the EO polymer
2 waveguide has a higher refractive index than the passive polymer waveguide.

1 17. The waveguide structure of claim 9, wherein the passive polymer
2 waveguide has a larger mode profile than the EO polymer waveguide.

1 18. The waveguide structure of claim 9, wherein the EO polymer
2 waveguide comprises a nonlinear chromophore.

1 19. The waveguide structure of claim 18, wherein the nonlinear
2 chromophore includes a tricyanobutadiene acceptor and a phenyltetraene bridge.

1 20. The waveguide structure of claim 9, wherein the passive polymer
2 waveguide comprises a fluorinated polymer.

1 21. The waveguide structure of claim 9, wherein the passive polymer
2 waveguide comprises a fluorinated acrylate.